

Technology Opportunity

High-Temperature Power Electronics

The National Aeronautics and Space Administration (NASA) seeks to transfer technology for electrical power components that can operate in high-temperature environments.

Potential Commercial Uses

- High-temperature industrial processing
- Engine-mounted electronics for the auto industry
- Control electronics for nuclear power plants
- Robotics and instrumentation for chemical plants
- Instrumentation and sensors for well logging

Benefits

- Simplifies thermal management requirements
- Survives hostile environments
- Increases system energy and power densities
- Reduces radiator weight in space systems
- Reduces spacecraft launch costs

The Technology

In many future NASA missions (such as deep-space exploration, the National AeroSpace Plane, minisatellites, integrated engine electronics, and ion or arcjet thrusters) high-power electrical components and systems must operate reliably and efficiently in high-temperature environments. Such high-temperature electronics will not only provide tolerance to hostile environments, but will reduce system size and weight by eliminating radiators and thereby reducing launch cost, improving reliability and lifetime, and increasing energy densities. High-temperature electronic components also will have a great influence in terrestrial applications such as well logging, the automotive industry, nuclear power, and industrial processing plants.

State-of-the-art power components are limited to a maximum operating temperature of 105 °C, with some devices functioning at temperatures up to

150 °C. The high-temperature power electronics program at the NASA Glenn Research Center focuses on dielectric and insulating material research, the development and characterization of high-temperature components, and integration of the developed components and devices into a demonstrable 200 °C power system—such as an inverter. In support of this work, various electrical components including capacitors, inductors, transformers, cables, and semiconductor switches are being developed or evaluated.

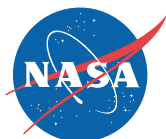
NASA Glenn has developed high-temperature power components through collaborative efforts with the Air Force Wright Laboratory, Northrop Grumman, and the University of Wisconsin. Ceramic and film power capacitors, moly permalloy powder (MPP) inductors, and a coaxially wound transformer were developed and have demonstrated stable operation from 20 to 200 °C in the frequency range of 50 Hz to 100 kHz. Limited life testing also has been performed on these components.

Options for Commercialization

NASA Glenn is seeking a partner for commercialization and/or development of this technology, possibly under a Space Act Agreement.

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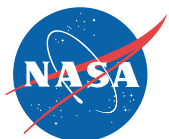
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Key Words

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References

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